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Method for automatically setting the gain of an interrogator receiver
within a non-contacting identification system

The present invention relates to an improvement of such method for automatically setting the gain of an interrogator receiver within a non-contacting identification system, which system consists of the interrogator and several transponders, that an attack in a receiver amplifier of the interrogator is activated each time when an amplified input signal exceeds an attack threshold voltage level, and a decay is activated after the attack has ended, the improvement being accomplished by means of considering at the characteristics of the communication between the interrogator and the transponders.

A non-contacting identification system consists of an interrogator generating radio frequency electromagnetic waves, and of one or several transponders, for which said electromagnetic waves represent an energy source. The transponders send data to the interrogator by transmitting appropriately modulated waves as received.

Variations, as produced by said modulation, in the level of the received signal are amplified in a receiver of the interrogator. In order to cover the largest possible communication space region, the receiver has the largest gain as allowed by the input noise level. The range of levels of the received signal is namely rather wide since the distance between the interrogator and any one of the transponders may be quite

different, actually from practically zero to the largest distance across which the communication is still possible. Therefore the receiver has a high gain to reliably receive even very low input signals. In order that no difficulties at the amplification of high input signals appear, any known method is used, which are of two kinds: either the amplified input signal is limited or the receiver gain is automatically adjusted to the input signal level.

In the known methods of the first kind the amplified input signal is limited in the amplifying stage, in which a resistor in an amplifier feed-back loop is shunted by a Zener diode; when the signal amplitude exceeds the Zener diode threshold, the gain is immediately reduced. A drawback is that the ratio of the useful signal to the noise signal at the output of the amplifier is worse than at its input.

In the known methods of the second kind the gain is set automatically, *e.g.* according to patent US 5,929,706. They are especially known in the field of telecommunications and audio systems. According to this method, when the input signal level is high, the gain of the receiving path is automatically adjusted, *i.e.* lowered, so that the received signal remains within the linear receiver operation region.

When an overly high signal is detected, an attack is activated, so a rapid gain lowering is started until an appropriate signal height is attained. At that moment or when the signal ceases to exist, the decay begins. So the gain rises slowly to a high level, on which the system persists till the next attack. When the sine-shaped input signal is high for a fairly long time, the output amplitude is really lowered below the limit of a gain correcting activation, yet the decay again raises the output signal out of the linearity region and therefore the attack is activated once again. The system permanently switches over between the states of the attack and the decay. The attack rate must be several orders of magnitude above the decay rate, moreover, both rates must be matched to the nature and the frequency spectrum of the input signals.

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after the lapse of the waiting period, which started when the instantaneous amplified signal value for the last time after the end of the attack exceeded the waiting threshold voltage level V_w .

At the arrival of the second data wave packet b the attack is activated. The decay lasts practically the whole time, while the wave packet b arrives; the output signal U_{out} namely exceeds the attack threshold voltage level V_{att} even at the lowest settable gain. After the lapse of the waiting period following the cease of the data wave packet, the gain is reset to its highest value.

Claims

1. Method for automatically setting the gain of an interrogator receiver within a non-contacting identification system consisting of the interrogator and several transponders,

according to which method, within a receiver amplifier of the interrogator, an attack is activated each time when an amplified input signal exceeds an attack threshold voltage level V_{att} , and a decay is activated after the attack has ended, characterized in

that the amplifier responds with a decay activated after the lapse of a waiting period which started when the instantaneous amplified signal value for the last time after the end of the attack exceeded a waiting threshold voltage level V_w .

2. Method as recited in claim 1, characterized in

that the decay rate is of the same order of magnitude as the attack rate.

3. Method as recited in claim 1 or 2, characterized in

that the length of the waiting period equals a double length of the longest time interval between the adjacent pulses in a transponder data wave packet.

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